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JUNE 4, 1990

CHEMICAL & ENGINEERING

NEWS

PRELIMINARY PROGRAM
ACS national meeting in
Washington, D.C. Page 43

Caltech's Harry B. Gray wins 1991 Priestley Medal

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CHEMICAL & ENGINEERING
NEWS
JUNE 4, 1990

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News of the Week

■ **Production of chemical arms would be halted by pact to be signed last week by U.S., Soviet presidents at their Washington summit meeting.** Page 4

■ **Chemist Bassam Shakhashiri, a popular proponent of science education, is being removed from his NSF post in a reorganization of the agency's education efforts.** Page 5

■ **Indian government is pursuing court action to overturn Union Carbide's Bhopal settlement.** Page 5

■ **UN panel warns of significant global warming in coming century unless emissions of greenhouse gases are curbed.** Page 6

Business

Arco Chemical's Harold Sorgenti discusses many issues and concerns currently confronting the chemical industry. **Page 9**

Government

Increased number of minorities in research is aim of NIH supplemental funding program. **Page 15**

R&D spending by the 50 states grew sharply in the eighties, according to an NSF-supported study. **Page 16**

Science Policy

Nikolai P. Laverov, chairman of the U.S.S.R. State Committee for Science & Technology, discusses Soviet R&D priorities. **Page 17**

Science/Technology

Search for a complete picture of hydrogen exchange reaction has led to close cooperation between experimentalists and theoreticians. **Page 32**

Books

"The Mind Has No Sex? Women in the Origins of Modern Science" is historical account of women striving to become scientists. **Page 41**

Preliminary Program

ACS's 200th national meeting this August in Washington, D.C., features variety of symposia; advance registration coupon provided. **Page 43**

Cover: Photo by C&EN's Rudy M. Baum

Priestley Medal

Harry B. Gray, who is Arnold O. Beckman Professor of Chemistry at California Institute of Technology, will receive ACS's 1991 Priestley Medal, in recognition of his efforts in research and chemical education and his leadership in the chemistry community. Page 25

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LETTERS

CHEMICAL SAFETY: Silane distillation explosion

SIR: The letter from Jonathon D. Rich (C&EN, March 26, page 2) describing explosions that occurred during the distillation of 1,2-dichlorotetramethyldisilane prompted us to write concerning our experiences with the distillation of chloropentamethyldisilane.

On several occasions during the distillations (under N_2) of samples of chloropentamethyldisilane that had been prepared by the procedure of Kumada et al. [*J. Org. Chem.*, 21, 1264 (1956)], several violent exotherms occurred that resulted in rapid temperature increases to greater than 220 °C in the distillation head. In at least one case, these temperatures were realized even with the heating mantle removed from the apparatus. The pot residue after these exotherms consisted of a white solid that could be stored for extended periods of time at room temperature and which slowly released a corrosive gas (presumably HCl) in air. The reactions we observed were sufficiently violent that we have provided warnings in the experimental sections of two separate articles [*J. Organomet. Chem.*, 332, 271 (1987); and *J. Am. Chem. Soc.*, 111, 4809 (1989)].

We, too, highly recommend the use of adequate safety procedures and protective equipment when distilling chloropentamethyldisilane, 1,2-dichlorotetramethyldisilane, or related compounds.

Keith A. Horn
Research Associate
Allied-Signal Inc., Morristown, N.J.

Nonconjugated polymers

SIR: I read the report prepared by Stu Borman on "Alternate Theories of Conductivity in Nonconjugated Polymers Debated" (C&EN, May 7, page 53). Unfortunately, Borman did not cover the latest developments in understanding the mechanism of conductivity in nonconjugated polymers based on the recent experimental facts. We published a paper in the Dec. 15, 1989, issue of the *Journal of Chemical Physics*. (This work was also presented in the International Chemical Congress Meeting of Pacific Basin Societies, Honolulu, Dec. 17–22, 1989.) The results in this paper clearly resolve the issue presented in Borman's report. Our paper explains the molecular basis of conductivity in the nonconjugated polymers and shows that solid-state magic-angle nuclear magnetic resonance results clearly rule out the two models suggested by Bruce Hudson and Gary Wnek.

The cross polarization and magic-angle solid-state ^{13}C NMR data show that the concentration of double bonds is decreased upon doping. Double bonds are reformed as the doped sample is exposed to ammonia. This demonstrates the reversibility of doping.

Solid-state NMR data do not agree with the iodonium ion (π-complex) model proposed by Hudson. If Hudson's proposal were correct, then in the experimental solid-state NMR data the intensity of double bond should not decrease upon doping or increase after compensation with ammonia (reversibility of doping).

Iodinium ion (σ-complex) proposed by Wnek is also inconsistent with the observation of reformation of double bonds when the complex formation was reversed. According to Wnek, σ-complex is formed upon doping. If this were true then the doping phenomenon would be irreversible. The solid-state NMR results, however, clearly show that the double bonds are reformed once the doped sample is compensated with ammonia. The data presented in the Honolulu meeting also include the FTIR data to show the reversibility of the phenomenon.

Published solid-state NMR and FTIR data disagree with the proposals made by Hudson and Wnek and support the polaronic model.

A. L. Cholli
Lead Scientist, BOC Group
Murray Hill, N.J.

Reply: The paper by A. L. Cholli and M. K. Thakur [*J. Chem. Phys.*, 91, 7912 (1989)] describes the results of ^{13}C NMR studies of iodine-treated polyisoprene. The major experimental observation reported is that iodine treatment results in a decrease in the intensity of resonances due to the two olefinic carbons in the 120- to 140-ppm region. New features appear in the aliphatic region of the spectrum (20 to 40 ppm) but there is no identification of resonances due to the hypothetical radical cation species proposed by these authors.

The loss of olefinic resonances is certainly understandable according to our proposal that complexes form between the carbon-carbon double bonds and the

uate research assistant with supplemental funds from NIGMS. The young woman, Tracey Simmons, "may have the only room on campus with a periodic table for a wall poster," Fenselau says.

Without the salary provided by NIH, Simmons would have had to earn money at some other part-time job rather than spending time in the laboratory, according to Fenselau. "In my opinion she is progressing better through her science education because she has a connection with a working scientist, a 'lab home,'" Fenselau says.

Another minority undergraduate will spend the summer working in the University of Rochester laboratory of chemistry professor Douglas H. Turner with the support of the NIH program. "This is a good chance for him to do research," Turner says of the young man, who until now has worked as a dishwasher in Turner's lab. "He definitely would not have had the opportunity" without the NIH supplement.

Minority scientists with at least one year of postdoctoral experience, but who have never received their own NIH grants, can work with established researchers under another part of the program. They can receive a salary at a maximum rate of $40,000 per year either working full-time for short periods—the summer, for instance—or part-time over longer periods such as the academic year.

For example, a former postdoctoral student of Johns Hopkins University assistant professor Kenneth D. Karlin and who is now teaching at a small college will spend the summer working in Karlin's lab funded by an NIH supplement. Karlin says the fact that he already had a relationship with the minority investigator was considered a negative factor by NIGMS, but he was awarded the supplemental funds anyway.

High school students, graduate research assistants, and postdoctoral fellows are also eligible for support under the NIH initiative.

The announcement of the supplemental awards program was first published in the April 21, 1989, edition of the *NIH Guide for Grants & Contracts*. A revised announcement, which makes it clear that postdoctoral students are also eligible for support and clears up some other details, will be published in the same newsletter this summer.

Pamela Zurer

States' spending on R&D up markedly

In 1988 the 50 states devoted, on average, less than one quarter of 1% of their total expenditures to R&D-related activities and accounted for less than 1% of total R&D spending in the U.S. Taken together, they spent just over $1 billion for conduct of R&D and some $200 million in support of the R&D infrastructure.

Those are the findings of a survey conducted in late 1988 by Syracuse Research Corp., under a grant from the National Science Foundation, of R&D expenditures by state agencies. The results of the survey were recently published by NSF, which in 1977 sponsored the last survey of state R&D expenditures.

Comparing the two surveys shows that states' R&D expenditures, excluding R&D plant, grew a healthy 193% between 1977 and 1988. Factoring in inflation drops that number to 62%. Federal R&D expenditures increased by even less, 55%, during the same period.

In 1977, 10 states accounted for 64% of R&D spending by the states, with the top five contributing 50%. By 1988 R&D expenditures were more concentrated: The top 10 accounted for 78% of all R&D spending, with the top three alone contributing over 55% of the total.

New York spent the most on R&D—nearly $330 million—and accounted for 31% of R&D spending by the states in 1988. New Hampshire spent the least—nothing. Maryland was second at about $176 million. California ranked third at $76.3 million, according to the survey, but that may be a low estimate.

The survey specifically excluded direct appropriations to universities and colleges from its R&D database. Since California's constitution mandates that its state university and college systems act as the state's major research arm, the report says, California's total R&D commitment, and possibly that of other states, may not be adequately reflected in its ranking.

The five most popular research areas reported by the states in 1988 were health at $286 million; energy, $108 million; natural resources, $106 million; science- and technology-based, $105 million; and economic growth and productivity, $64.2 million. The report notes that research spending in the latter two categories increased from a combined total share of 2% in 1977 to 19% in 1988.

Single copies of "Research and Development Expenditures of State Government Agencies: Fiscal Years 1987 and 1988," Special Report, NSF 90-309, can be obtained free from the Division of Science Resources, National Science Foundation, Washington, D.C. 20050.

Janice Long

Five states rank in top 10 in both R&D spending . . .

$ Millions	
New York	$329.9
Maryland	175.8
California	76.3
Illinois	58.5
Pennsylvania	41.1
New Mexico	34.1
Ohio	33.4
New Jersey	22.8
South Carolina	22.0
Texas	21.1
TOTAL	$815.0

. . . and percent of total state spending devoted to R&D

Percent	
Maryland	1.88%
New Mexico	1.13
New York	0.86
Nevada	0.61
Wisconsin	0.52
Alaska	0.42
South Carolina	0.37
Illinois	0.34
Idaho	0.33
Montana	0.24

Note: Fiscal year 1988.
Source: National Science Foundation